AF/1632/15

Practitioner's Docket No. MSU 4.1-458 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Linda S. Mansfield, Mary Rossano, Alice Murphy and Ruth Vrable
Application No.: 09/513,086 Group No.: 1632
Filed: February 24, 2000 Examiner: Joseph T. Woitach
For: VACCINE TO CONTROL EQUINE PROTOZOAL MYELOENCEPHALITIS IN HORSES

Assistant Commissioner for Patents
Washington, D.C. 20231

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION—37 C.F.R. § 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on 6/18/2002.

NOTE: "Appellant must, within two months from the date of the notice of appeal under § 1.191 or within the time allowed for reply to the action from which the appeal was taken, if such time is later, file a brief in triplicate. . . ." 37 C.F.R. § 1.192(a) (emphasis added).

2. STATUS OF APPLICANT

This application is on behalf of

- ☒ other than a small entity.
- ☐ a small entity.

A statement:

- ☐ is attached.
- ☐ was already filed.

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:

☐	small entity	$160.00
☒	other than a small entity	$320.00

Appeal Brief fee due $ 320

CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. § 1.8(a))

I hereby certify that this correspondence is, on the date shown below, being:

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☒ deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Date: 8/07/2002

FACSIMILE

☐ transmitted by facsimile to the Patent and Trademark Office.

Tammi L. Taylor
Signature

Tammi L. Taylor
(type or print name of person certifying)

4. EXTENSION OF TERM

NOTE: The time periods set forth in 37 C.F.R. § 1.192(a) are subject to the provision of § 1.136 for patent applications. 37 C.F.R. § 1.191(d). See also Notice of November 5, 1985 (1060 O.G. 27).

NOTE: As the two-month period set in § 1.192(a) for filing an appeal brief is not subject to the six-month maximum period specified in 35 U.S.C. § 133, the period for filing an appeal brief may be extended up to seven months. 62 Fed. Reg. 53,131, at 53,156; 1203 O.G. 63, at 84 (Oct. 10, 1997).

The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136 apply.

(complete (a) or (b), as applicable)

(a) ☐ Applicant petitions for an extension of time under 37 C.F.R. § 1.136 (fees: 37 C.F.R. § 1.17(a)(1)-(5)) for the total number of months checked below:

Extension (months)	Fee for other than small entity	Fee for small entity
☐ one month	$ 110.00	$ 55.00
☐ two months	$ 390.00	$ 195.00
☐ three months	$ 890.00	$ 445.00
☐ four months	$ 1,390.00	$ 695.00
☐ five months	$ 1,890.00	$ 945.00

Fee: $_____

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for _____ months has already been secured, and the fee paid therefor of $_____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request $_____

or

(b) ☒ Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE

The total fee due is:

Appeal brief fee $ 320

Extension fee (if any) $ -0-

TOTAL FEE DUE $ 320

6. FEE PAYMENT

☒ Attached is a ☒ check ☐ money order in the amount of $ 320

☐ Authorization is hereby made to charge the amount of $ _____

☐ to Deposit Account No. _____

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A duplicate of this paper is attached.

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NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to change the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, *1065 O.G. 31-33.*

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SIGNATURE OF PRACTITIONER

Ian C. McLeod

(type or print name of practitioner)

2190 Commons Parkway

P.O. Address

Okemos, MI 48864

MSU 01-458
08/26/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Linda S. Mansfield, Mary Rossano, Alice Murphy, and Ruth Vrable

Serial No. 09/513,086 Group Art Unit: 1632

Filing Date: February 24, 2000

Title: VACCINE TO CONTROL EQUINE PROTOZOAL MYELOENCEPHALITIS IN HORSES

Examiner: Joseph T. Woitach

BOX APPEALS

Commissioner of Patents and Trademarks

Washington, D.C. 20231

APPEAL BRIEF UNDER 37 C.F.R. § 1.192

Sir:

This is an appeal from a final rejection in the above entitled application. The claims on appeal are set forth as Appendix A. An oral hearing will be requested. Enclosed are three (3) copies of this Brief and the fee due upon filing of the Brief.

(1) Real Party in Interest

The real party in interest is the Board of Trustees operating Michigan State University, East Lansing, Michigan, a constitutional corporation of the State of Michigan, which is the assignee of the above entitled application.

(2) Related Appeals and Interferences

There are no related appeals and interferences.

(3) Status of Claims

Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 are pending. No claims have been allowed.

(4) Status of Amendments

An Amendment After Final mailed May 24, 2002, was entered.

(5) Summary of Invention

The present invention provides a vaccine for preventing disease in an equid caused by a *Sarcocystis neurona* infection comprising a 16 (±4) kDa *Sarcocystis neurona* antigen and a 30 (±4) kDa *Sarcocystis neurona* antigen (Specification: page 13, lines 1-5).

In a further embodiment, the antigen is a recombinant polypeptide produced in a plasmid (Specification: page 17, lines 23-24) in a microorganism other than *Sarcocystis neurona* (Specification: page 13, lines 5-8). Preferably in this embodiment, the microorganism is an *E. coli* (Specification: page 16, lines 10-16; page 17, lines 23-27). It is further preferable that the vaccine is provided in a pharmaceutically accepted carrier (Specification: page

14, lines 1-3).

In a further embodiment, the antigen is a fusion polypeptide wherein an amino end or a carboxyl end of the antigen is fused to all or a portion of a polypeptide that facilitates isolation of the antigen from the microorganism in which the antigen is produced (Specification: page 18, lines 8-20). Preferably, the polypeptide is selected from the group consisting of glutathione S-transferase (Specification: page 19, lines 2-7), protein A (Specification: page 20, lines 6-14), maltose binding protein (Specification: page 21, lines 1-5), and polyhistidine (Specification: page 19, lines 18-21).

The present invention further provides a method for preventing disease in an equid caused by a *Sarcocystis neurona* infection comprising (a) providing a composition consisting essentially of a 16 (±4) kDa antigen and a 30 (±4) kDa antigen of *Sarcocystis neurona* (Specification: page 13, lines 1-5); and (b) vaccinating the equid with the composition to prevent the disease (Specification: page 3, lines 24-29).

In a further embodiment, the recombinant antigen is in a pharmaceutically accepted carrier (Specification: page 14, lines 1-3).

In a further embodiment, the recombinant antigen is a fusion polypeptide which is fused at the amino terminus or carboxyl terminus to a polypeptide

that facilitates the isolation of the recombinant antigen (Specification: page 18, lines 8-20). Preferably, the polypeptide includes all or a portion of the polypeptide selected from the group consisting of glutathione S-transferase (Specification: page 19, lines 2-7), protein A (Specification: page 20, lines 6-14), maltose binding protein (Specification: page 21, lines 1-5), and polyhistidine (Specification: page 19, lines 18-21). It is further preferable that the DNA is in a plasmid in a microorganism wherein the DNA is operably linked to a promoter which enables transcription of the DNA to produce the recombinant antigen for the vaccine (Specification: page 17, lines 23-27).

The present invention further provides a method for preventing disease in an equid caused by a *Sarcocystis neurona* infection which comprises providing a composition that when injected into the equid causes the equid to produce antibodies against a 16 (±4) kDa antigen and a 30 (±4) kDa antigen of the *Sarcocystis neurona* wherein the antibodies prevent the disease caused by the *Sarcocystis neurona* (Specification: page 9, lines 22-29; page 26, lines 20-26).

In a further embodiment, the vaccine comprises the 16 (±4) kDa antigen and/or 30 (±4) kDa antigen in a vaccine carrier (Specification: page 14, lines 1-3).

In a further embodiment, the vaccine comprises a DNA plasmid encoding the 16 (±4) kDa antigen and/or 30

(±4) kDa antigen (Specification: paragraph bridging pages 24-25).

In a further embodiment, the vaccine is administered by a vaccination route selected from the group consisting of intranasal administration, intramuscular injection, intraperitoneal injection, intradermal injection, and subcutaneous injection (Specification: page 13, lines 29-31).

(6) Issues

Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 were indicated to be free of the prior art, however, the claims remain rejected under 35 U.S.C. § 112, first paragraph, as follows.

(a) Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 were rejected under 35 U.S.C. § 112, first paragraph.

The basis of the rejection was stated to be that because the neither the amino acid sequences comprising the antigens nor the DNA encoding the antigens have been identified or described, the written description is not sufficient to support claims drawn to vaccines comprising the 16 (±4) and 30 (±4) kDa antigens and methods for using the vaccines.

(b) Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 were rejected under 35 U.S.C. § 112, first paragraph.

The rejection stated that the specification does not provide a nexus between the 16 (±4) and 30 (±4)

kDa antigens and a functional vaccine comprising the same; therefore, the specification does not enable claims drawn to vaccines comprising of the 16 (±4) and 30 (±4) kDa antigens and methods for using the vaccines.

(7) Grouping of Claims

The claims are grouped into two groups, each of which is separately patentable. Group 1 consists of Claims 4 to 9 and 13 to 17, all of which stand or fall together. Group 2 consists of Claims 45, 46, 49, and 50, all of which stand or fall together.

The claims of Group 2 are separately patentable from the claims of Group 1 because even if the claims of Group 1 were found to be unpatentable because of the written description is inadequate to support a vaccine consisting of the 16 (±4) and 30 (±4) kDa antigens, it would still be possible to provide a composition that induced an equid to produce antibodies against the 16 (±4) and 30 (±4) kDa antigens that did not consist solely of the 16 (±4) and 30 (±4) kDa antigens. For example, a killed *Sarcocystis neurona* composition would be expected to elicit antibodies against both the 16 (±4) and 30 (±4) kDa antigens.

(8) Argument

(a) Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 were rejected under 35 U.S.C. § 112, first paragraph.

It was stated that because the sequences (amino acid or nucleotide) for the 16 (±4) and 30 (±4) kDa antigens were not been provided, the written description is inadequate to support claims drawn to vaccines comprising the 16 (±4) and 30 (±4) kDa antigens and methods for using the vaccines.

The specification is believed to satisfy the written description requirement of 35 U.S.C. § 112, first paragraph. Thus, the specification supports Claims 4 to 9 and 13 to 17, which provide a vaccine comprising the 16 (±4) and 30 (±4) kDa antigens and a method for using the vaccine to prevent disease in horses caused by *Sarcocystis neurona* and Claims 45, 46, 49, and 50, which provide a method for preventing disease in a horse caused by *Sarcocystis neurona* using a composition for inducing antibodies against the 16 (±4) and 30 (±4) kDa antigens.

The specification describes the 16 (±4) and 30 (±4) kDa antigens by their respective mobilities on SDS polyacrylamide gels (Specification: page 36, lines 22-27; U.S. Serial No. 09/156,954, which is now U.S. Patent No. 6,153,394 and which was incorporated by reference) and two-dimensional gels (Specification: page 33, lines 29-34), by their ability to bind antibodies in antisera from horses infected with *Sarcocystis neurona* (Specification: U.S. Patent No. 6,153,394), and by their inability to bind antibodies from other *Sarcocystis*

species (Specification: page 13, lines 16-21).

The specification further teaches in Example 1 that the 16 (±4) and 30 (±4) kDa antigens were isolated by two-dimensional gel electrophoresis (page 33, lines 29-34) and teaches a method for preparing monoclonal antibodies using the purified 16 (±4) and 30 (±4) kDa antigens. The monoclonal antibodies can be used to identify the 16 (±4) and 30 (±4) kDa antigens (Specification: page 33, line 20). The above disclosure is believed to enable one skilled in the art to visualize or recognize the identity of the 16 (±4) and 30 (±4) kDa antigens.

While the Court in Regents of the University of California v. Eli Lilly & Co., 43 USPQ2d 1398 (Fed. Cir. 1997) and Enzo Biochem, Inc. v. Gen-Probe Incorporated, No. 01-1230 (Fed. Cir. April 2, 2002) held that for many cases the only way to adequately describe genetic material is to provide the sequence of the material, the applicants believe the present case is distinguishable.

In Eli Lilly, the appellant had provided the nucleotide sequence for a DNA encoding rat insulin but had claimed all vertebrate DNAs encoding insulin. The Court found that the written description for rat insulin was adequate but was inadequate to support all vertebrate DNAs encoding insulin. The Court concluded that for claims to a DNA sequence encoding a protein, it

is inadequate to describe the DNA merely by its function, that is by merely stating that it encodes the protein. The Court stated "that an adequate written description of genetic material "requires a precise definition, such as by structure, formula, chemical name, or physical properties.'" Eli Lilly, at 1404 (quoting Fiers v. Revel, 25 USPQ2d 1601, 1606 (Fed. Cir. 1993)). Thus, to adequately describe the DNA, the structure of the DNA must also be disclosed, which in most cases is the nucleotide sequence of the DNA.

The Court reaffirmed in Enzo. In Enzo, the appellant had claimed DNA probes which selectively hybridize to genetic material of the bacteria that cause gonorrhea. The Court it stated that describing DNA probes by their ability to hybridize to particular DNA sequences merely describes the function of the DNA probes and as such provides an insufficient written description of the DNA probes. To adequately describe the probes, the probes must be described by their structure, i.e., their nucleotide sequences. Thus, the Court has consistently held "that an adequate written description of genetic material '"requires a precise definition, such as by structure, formula, chemical name, or physical properties,"' not a mere wish or plan for obtaining the claimed chemical invention.'" Enzo at 7 (quoting Eli Lilly, 43 USPQ2d 1398, 1404 (Fed. Cir. 1997) which was quoting Fiers v. Revel, 25 USPQ2d 1601,

1606 (Fed. Cir. 1993)).

The present case is distinguishable from the case in Eli Lilly or Enzo because in contrast to the facts in Eli Lilly where the appellants were trying to claim DNA encoding insulin from a variety of organisms, the applicants are not trying to claim any more than the 16 (±4) and 30 (±4) kDa antigens of *Sarcocystis neurona* and in contrast to the facts in Enzo where the appellant's DNA probes depended on the sequence of the probes, the applicants' claimed vaccines and methods do not depend on the nucleotide sequences encoding the antigens. The present case is further distinguishable from the case in Eli Lilly and Enzo because unlike the claims in those cases, the claims in the present case are drawn to a vaccine comprising the antigens or a composition which induces antibodies against the antigens, not to genetic material encoding the antigens.

In the present case, the 16 (±4) and 30 (±4) kDa antigens are described by their physical properties, not merely by function. The 16 (±4) and 30 (±4) kDa antigens are described by their source (isolated from *Sarcocystis neurona*), by their molecular weight as determined by SDS gel electrophoresis, by their ability to bind particular antibodies in antisera from horses infected with *Sarcocystis neurona*, and by their ability to bind monoclonal antibodies prepared against them. These physical properties convey sufficient information

about the antigens to distinguish them from the other proteins of *Sarcocystis neurona*. There is no need to know the amino acid sequence of the antigens or the nucleotide sequence encoding the antigens. Therefore, a person of ordinary skill in the art following the teachings in the specification of the present application would be able to identify and isolate the 16 (±4) and 30 (±4) kDa antigens of *Sarcocystis neurona*.

Furthermore, the applicants are not claiming the 16 (±4) and 30 (±4) kDa antigens *per se*. They are claiming a composition that comprises at the least the 16 (±4) and 30 (±4) kDa antigens of *Sarcocystis neurona*. In one embodiment, such a composition could consist of the entire *Sarcocystis neurona* organism, which because the 16 (±4) and 30 (±4) kDa antigens are an inherent property of the organism, would include the 16 (±4) and 30 (±4) kDa antigens. In that embodiment, the written description clearly would be adequate without the necessity of providing the amino acid sequence of every protein comprising the composition.

With respect to Group 2 Claims 45, 46, 49, and 50 in particular, even if the Group 1 claims comprising the 16 (±4) and 30 (±4) kDa antigens were found to not be adequately supported, the Group 2 claims would still be adequately supported by the specification. The specification at page 9, lines 22-29, provides a method for protecting horses against *Sarcocystis neurona* by

providing a compositions that induces antibodies against both the 16 (±4) and 30 (±4) kDa antigens. This can be achieved by providing a composition comprising the 16 (±4) and 30 (±4) kDa antigens or a composition consisting of the whole *Sarcocystis neurona* organism or a subfraction thereof which contains the 16 (±4) and 30 (±4) kDa antigens. The whole organism or subfraction thereof would induce antibodies against the 16 (±4) and 30 (±4) kDa antigens. Thus, even if there is inadequate support for the 16 (±4) and 30 (±4) kDa antigens *per se*, it is believed that there still would be adequate support for a composition that induces antibodies against the 16 (±4) and 30 (±4) kDa antigens which consists of the whole organism or subfraction thereof which contains the 16 (±4) and 30 (±4) kDa antigens.

In light of the above, the specification is believed to provide an adequate written description of the 16 (±4) and 30 (±4) kDa antigens comprising the claimed vaccine and method for use to prevent disease in a horse caused by *Sarcocystis neurona* as set forth in Claims 4 to 9 and 13 to 17. The written description is also adequate to support Claims 45, 46, 49, and 50 drawn to a method for preventing disease in a horse caused by *Sarcocystis neurona* using a composition for inducing antibodies against the 16 (±4) and 30 (±4) kDa antigens.

In light of the above, reversal of the rejection is requested.

(b) Claims 4 to 9, 13 to 17, 45, 46, 49, and 50 were rejected under 35 U.S.C. § 112, first paragraph, because the specification was stated to be non-enabling for a vaccine against *Sarcocystis neurona*. In support, the Examiner cited Liang (Infection and Immunity 66: 1834-1838 (1998)) and Kisthardt (Equine Practice 19: 8-13 (1997)).

The specification is believed to satisfy the enablement requirement of 35 U.S.C. § 112, first paragraph. Thus, Claims 4 to 9 and 13 to 17 drawn to a vaccine comprising the 16 (±4) and 30 (±4) kDa antigens and a method for using the vaccine to prevent disease in horses caused by *Sarcocystis neurona* and Claims 45, 46, 49, and 50 drawn to a method for preventing disease in a horse caused by *Sarcocystis neurona* using a composition for inducing antibodies against the 16 (±4) and 30 (±4) kDa antigens, are enabled by the specification, particularly when the specification is viewed in light of Kisthardt and Liang.

Kisthardt states that as of February 1997, a vaccine against *Sarcocystis neurona* is not available. However, Kisthardt also states that "much progress is being made on understanding the antigenic makeup and genome of the parasite" and that "once the horse/possum life cycle is confirmed and reproduced experimentally then the development of effective vaccines should follow" (Kisthardt: page 13, first col., first para.).

The applicants provide in Example 3 (Specification: pages 38 to 43) an improved method for the isolation, exocystation, and culture the isolation of *Sarcocystis neurona* using opossums as a model. The applicants demonstrate that *Sarcocystis neurona* can be isolated from opossums fed wild-caught cow-birds or grackles and cultured on equine dermal cells. Viewing the applicants' disclosure related to isolating *Sarcocystis neurona* from opossums and the applicants' claimed vaccines and use in light of Kishardt and the teachings of Liang as set out below indicates there is a reasonable basis for finding a nexus between the 16 (±4) and 30 (±4) kDa antigens and a functional vaccine comprising the same.

Liang teaches that sera from horses with equine protozoal myeloencephalitis (EPM) contain antibodies against several antigens, including the 16 (±4) and 30 (±4) kDa antigens. Liang teaches that the 16 kDa antigen neutralizes *Sarcocystis neurona* infectivity (Liang: Figure 2). Liang teaches that there is an extensive body of data to indicate that antibodies to apicomplexan parasites is protective (Liang: page 1836, discussion). Liang teaches that most horses that are exposed to *Sarcocystis neurona* in the field develop effective immunity which may prevent the parasite from entering the central nervous system (Liang: page 1834, third para.). The applicants teach that sera from

horses with EPM contain antibodies which are specific to the 30 (±4) kDa antigen of *Sarcocystis neurona*. Therefore, the 30 (±4) kDa antigen is involved in the immune response against *Sarcocystis neurona*. Thus, there is a nexus between a vaccine or composition containing the 16 (±4) and 30 (±4) kDa antigens and a vaccine or composition which prevents disease caused by *Sarcocystis neurona* comprising the same.

Since horses with EPM have antibodies against the 16 (±4) and 30 (±4) kDa antigens and many of these same horses develop immunity against the parasite, at a minimum it would be expected that a vaccine or composition comprising the 16 (±4) and 30 (±4) kDa antigens would also induce antibodies against the 16 (±4) and 30 (±4) kDa antigens and that some of the vaccinated horses will develop immunity against the parasite. The applicants' vaccine or composition does not have to provide good efficacy, it merely has to enable some horses to develop immunity to the parasite.

Since many horses infected with *Sarcocystis neurona* do not have clinical symptoms and these same horses have antibodies against the 16 (±4) and 30 (±4) kDa antigens, it is reasonable to expect that a vaccine containing the 16 (±4) and 30 (±4) kDa antigens would provide protective immunity to at least some vaccinated horses. Therefore, the applicants' disclosure is sufficient to give a person of ordinary skill in the art

a reasonable expectation of success, particularly in light of PCT WO 01/80885 ('885) to Bigbie *et al.*[1] which claims vaccines against *Sarcocystis neurona* comprising *Sarcocystis neurona* antigens and which shows that whole cell vaccines comprising *Sarcocystis neurona* are efficacious. In light of the applicants' disclosure, the '885, Liang, and Kishardt, any unpredictability as to the efficacy of the applicants' composition would not be expected to be excessive.

While the applicants do not provide working examples of the vaccine or composition, working examples are not necessary to providing an enabling disclosure. Regardless of any working examples which could have been provided by the applicant, a person of ordinary skill in the art would most likely test a range of antigen concentrations anyway to determine which concentrations of antigens would be most efficacious in the artisan's hands. Because such experimentation would be considered prudent and routine by those of ordinary skill in the art, such experimentation would not be undue or overly burdensome.

Liang also teaches that the 16 (±4) and 30 (±4) kDa antigens are surface antigens (*See* Liang: Fig. 3). While it could be argued that antibodies induced by the 16 (±4) and 30 (±4) kDa antigens may not kill the

[1]A copy of Bigbie *et al.* is provided in Appendix B.

parasite, it is more than likely that because surface antigens are important to the biology of the parasite and the antibodies induced against the 16 (±4) and 30 (±4) kDa antigens bind to the antigens at the surface of the parasite, the induced antibodies would prevent or inhibit to some degree disease caused by the parasite. That supposition is clearly supported by Liang: page 1837, second and third para. Therefore, when the applicants' specification is viewed in light of the state of knowledge in the art, Claims 4 to 9 and 13 to 17 drawn to a vaccine comprising the 16 (±4) and 30 (±4) kDa antigens and a method for using the vaccine to prevent disease in horses caused by *Sarcocystis neurona* and Claims 45, 46, 49, and 50 drawn to a method for preventing disease in a horse caused by *Sarcocystis neurona* using a composition for inducing antibodies against the 16 (±4) and 30 (±4) kDa antigens are enabled by the specification.

In light of the above, reversal of the rejection is requested.

(9) Conclusion

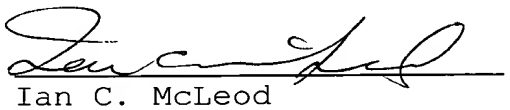
The specification is believed to satisfy the written description requirement of 35 U.S.C. § 112, first paragraph. Claims 4 to 9 and 13 to 17 and Claims 45, 46, 49, and 50 are believed to be adequately supported by the written description because the 16 (±4)

and 30 (±4) kDa antigens are described by their physical properties and not merely by their function. The physical properties include their mobilities on SDS polyacrylamide gels and two-dimensional gels, their ability to bind antibodies in antisera from horses infected with *Sarcocystis neurona*, and their inability to bind antibodies from other *Sarcocystis* species. The written description is sufficient to enable one skilled in the art to visualize or recognize the identity of the 16 (±4) and 30 (±4) kDa antigens even though the sequences for the antigens are not provided. Therefore, the written description is believed to be adequate to support Claims 4 to 9 and 13 to 17 and Claims 45, 46, 49, and 50.

The specification is also believed to satisfy the enablement requirement of 35 U.S.C. § 112, first paragraph. The specification teaches that there is a reasonable nexus between the 16 (±4) and 30 (±4) kDa antigens and vaccines comprising the same, particularly when the specification is viewed in light of the art at the time the invention was made. Therefore, Claims 4 to 9 and 13 to 17 and Claims 45, 46, 49, and 50 are believed to be adequately enabled by the specification even though the applicants have not provided any data demonstrating that antibodies against the 16 (±4) and 30 (±4) kDa antigens prevent disease caused by *Sarcocystis neurona*.

In light of the above, Claims 4 to 9 and 13 to 17 and Claims 45, 46, 49, and 50 are each separately patentable. Therefore, reversal of the rejections under 35 U.S.C. § 112, first paragraph, alleging inadequate written description and lack of enablement and remand to the Examiner for Notice of Allowance is requested.

Respectfully,



Ian C. McLeod
Registration No. 20,931

McLeod & Moyne, P.C.
2190 Commons Parkway
Okemos, MI 48864

(517) 347-4100
Fax:(517) 347-4103

APPENDIX A

-4-

A vaccine for preventing disease in an equid caused by a *Sarcocystis neurona* infection comprising a 16 (±4) kDa *Sarcocystis neurona* antigen and a 30 (±4) kDa *Sarcocystis neurona* antigen.

-5-

The vaccine of Claim 4 wherein the antigen is a recombinant polypeptide produced in a plasmid in a microorganism other than *Sarcocystis neurona*.

-6-

The vaccine of Claim 5 wherein the microorganism is an *E. coli*.

-7-

The vaccine of Claim 6 wherein the antigen is a fusion polypeptide wherein an amino end or a carboxyl end of the antigen is fused to all or a portion of a polypeptide that facilitates isolation of the antigen from the microorganism in which the antigen is produced.

-8-

The vaccine of Claim 7 wherein the polypeptide is selected from the group consisting of glutathione S-transferase, protein A, maltose binding protein, and polyhistidine.

-9-

The vaccine of Claim 6 wherein the vaccine is provided in a pharmaceutically accepted carrier.

-13-

A method for preventing disease in an equid caused by a *Sarcocystis neurona* infection comprising:

(a) providing a composition consisting essentially of a 16 (±4) kDa antigen and a 30 (±4) kDa antigen of *Sarcocystis neurona*; and

(b) vaccinating the equid with the composition to prevent the disease.

-14-

The method of Claim 13 wherein the recombinant antigen is in a pharmaceutically accepted carrier.

-15-

The method of Claim 13 wherein the recombinant antigen is a fusion polypeptide which is fused at the amino terminus or carboxyl terminus to a polypeptide that facilitates the isolation of the recombinant antigen.

-16-

The method of Claim 15 wherein the polypeptide includes all or a portion of the polypeptide selected from the group consisting of glutathione S-transferase, protein A, maltose binding protein, and polyhistidine.

-17-

The method of Claim 15 wherein the DNA is in a plasmid in a microorganism wherein the DNA is operably linked to a promoter which enables transcription of the DNA to produce the recombinant antigen for the vaccine.

-45-

A method for preventing disease in an equid caused by a *Sarcocystis neurona* infection which comprises providing a composition that when injected into the equid causes the equid to produce antibodies against a 16 (±4) kDa antigen and a 30 (±4) kDa antigen of the *Sarcocystis neurona* wherein the antibodies prevent the disease caused by the *Sarcocystis neurona*.

-46-

The method of Claim 45 wherein the vaccine comprises the 16 (±4) kDa antigen and/or 30 (±4) kDa antigen in a vaccine carrier.

-49-

The method of Claim 45 wherein the vaccine comprises a DNA plasmid encoding the 16 (±4) kDa antigen and/or 30 (±4) kDa antigen.

-50-

The method of Claim 45 wherein the vaccine is administered by a vaccination route selected from the group consisting of intranasal administration, intramuscular injection, intraperitoneal injection, intradermal injection, and subcutaneous injection.